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BASIC NOTES - SUMMARY OF CONCLUSIONS

"The murder of John F. Kennedy - a lone assassin?"

Conclusions:

(1) 1st shot: at approximately f.145-f.150 of Zapruder film. Shot hits JFK in right shoulder penetrating 1-2 inches. Bullet, is Commission Exhibit 399, later falls out of wound at Parkland. Shot fired from S.E. corner window of 6th floor TSED, at approx. 30° downward angle.

(2) 2nd shot: at f.224 of Zapruder film. Shot hits Governor Connally in chest, wrist, and thigh. Bullet fragments lost. Shot fired from S.E. window of 6th floor TSED, at approx. 20° downward angle.

(3) 3rd shot: at f.313 of Zapruder film. Shot hits JFK in head. Neuro-muscular reaction jerks JFK back, down and round to his left. Bullet fragments on way through JFK's skull; major portion carries on, in almost a straight line, to hit curb on S. side of Main, near underpass, and ricochet fragment hits James Tague on cheek. Shot fired from S.E. corner window of 6th floor TSED, at approx. 15° downward angle.

(4) JFK's anterior neckwound caused by sharp obliquely cut end of rose stem onto which JFK fell after fatal shot. Stem tears shirt and tie, punctures skin, tears trachea, and bruises apex of right lung.

(Hence; 5) One assassin, using C2766, fired three shots: - first shot before JFK disappears from clear view behind oak tree; second shot fired when JFK re-appears into clear view, approx. 4 seconds after first shot; third shot fired, as car begins to/

slow down and is moving almost directly away from line of fire, 4.9 seconds after second shot.

Reasons for conclusions:

(Conclusion 1): from Zapruder film, through f.171 to f.190 JFK's right arm, elbow resting on side of car, moves up and back and right hand makes waving movement - moving back, from wrist. Through f.190 to f.193 JFK's right arm and hand moves slightly forwards and down; this movement ceases at f.193, at which point JFK is looking directly to his right, and thereafter JFK turns towards front, his right arm and hand virtually stationary. This indicates JFK starts to react at approx. f.193; which gives him a reaction time of 2.4 seconds - this is feasible, JFK was on steroids for his adrenal deficiency, the drug(s) tending to depress the adrenals thereby slowing down the reaction to stress; and the bullet inflicted relatively slight damage.

From Zapruder film, f.171 through to f.183 Governor Connally, who is facing to his right, turns further to his right; is at furthest point in turn to right through f.183-f.186, after which he turns towards front. Correlate with his testimony - indicates shot prior to f.171 (and "Analysis of Zapruder frames 222 to 244" verifies Governor Connally's testimony with regard to his being shot).

From Zapruder film, at f.171 Jackie Kennedy looking to her left (can tell this from alignment of her pill-box hat); from f.171 onwards Mrs. Kennedy turns to her right - she is facing approx. straight forwards at f.180, by f.207 she has turned to face JFK. Correlate with her testimony - indicates shot prior to f.171.

Philip Willis said he took a photo due to sound of first shot making him flick shutter of camera. Willis claims it is photo/

photo no.5; photo 5 is clear, in focus, and level of bottom of photo is virtually parallel to line across top of concrete wall - e.g. camera held horizontally. Willis photo 4 is blurred and level of bottom of photo is at approximately 30° to line down side of concrete monument in background (and tree and people are also approximately 10° "off vertical") - e.g. camera not horizontally held. This indicates that Willis was mistaken and it is Willis photo 4 which was taken due to sound of first shot. Willis was about 170 feet from S.E. corner window 6th floor TSED, therefore time for sound of shot to reach him is 0.15 seconds, which is equivalent to 3 Zapruder frames. To this must be added Willis's reaction time - if it was a simple startle reflex it would be approximately 100 milliseconds, which is equivalent to 2 Zapruder frames. Since bullet probably travelling at approximately twice speed of sound there is equivalent of 1-2 Zapruder frames from assassin firing to bullet hitting JFK. Thus Willis photo approximately 3-4 Zapruder frames after impact frame in Zapruder film. Willis photo 4 is equivalent to approximately f.150-f.155 (this figure is arrived at by approximately extrapolation; using position of JFK at f.207, f.186 and f.171, relating these to Willis's approximate position and relation of JFK to concrete monument and tree in Willis photo 4).

FBI agents Sibert and O'Neill reported on the Autopsy. They reported that: Dr. Humes found a bullet hole "below the shoulders" and determined that the trajectory of the missile entering at this point had entered at a downward position of 45-60 degrees; and the bullet travelled a distance of less than a finger-length. This 45-60 degree angulation appears to be too steep an angle but in fact there is some ambiguity - Dr. Humes was probing the wound with JFK's body face down and horizontal, /

horizontal, if he meant that the bullet track was 45-60 degrees downwards in relation to his (Dr. Humes') horizontal frame of reference then, with JFK's body at 90° to Humes', the track of the bullet in JFK's shoulder was at 30-45 degrees downwards angle in relation to JFK when JFK sitting upright. If this is so, it correlates with the angle of rifle (in S.E. corner window of 6th floor TSB) to JFK at approximately f.145-f.150; angle is approximately 30° (again, figure arrived at by extrapolation of figures for later frames).

Autopsy surgeons found no bullet in shoulder wound. Bullet 399 found on stretcher - immense shock and confusion at Parkland Hospital; difficult to trace stretchers accurately; or perhaps Josiah Thompson's theory in "Six Seconds in Dallas" is correct. Little metal missing from C.E.399 - 1968 Panel Review of Autopsy X-rays and photos found several small fragments in neck, possibly came from C.E.399. Bullet into shoulder hit no bone - accounts for pristine condition of C.E.399. Low penetration of bullet possibly due to 'short charge'.

From Zapruder film, JFK holding onto his left coat lapel with his left hand prior to first shot. In reaction to first shot hitting his shoulder JFK lifts his right arm off side of car and brings it towards his mouth, right hand clenching. Left hand, still holding left lapel, rises up, as does left arm and elbow, releasing hold on lapel in region of f.248 (appears on P.18 of "Life" Dec.16, 1963); at f.258 (appears on same page as f.248) JFK's right hand has fallen lightly - started falling at about f.250 - and his left hand is not clenched - fingers, clearly visible, outstretched. In f.274 (appears on same page as above frames) JFK's left hand still has outstretched fingers; his right hand is in roughly same position as in f.248 but JFK is leaning more forwards and to his left than in f.248, left hand in/

in a similar position to that in f.248. JFK now appears to be grimacing rather than having quizzical look on his face as in previous frames.

Mrs. Kennedy started to react at f.233 - she lifted up her right arm, putting her hand on JFK's left elbow at f.244-6 thereafter pushing down JFK's left elbow, this having the effect of turning and tilting JFK to his left and forwards.

JFK probably clenched his right hand and brought his right hand across as a reaction to pain in right shoulder/neck region; then tried to reach over his right shoulder, towards area of pain, with his left hand, but due to Mrs. Kennedy holding JFK's left elbow and pushing it down JFK could not complete the movement. This is indicated by movement of JFK's left hand through the sequence up until f.280 (it is partially obscured by bottom of film frame through f.280-f.290).

(conclusion 2): See "Analysis of Zapruder frames 222 to 244".

And confirms testimony of almost everyone regarding JFK and Governor Connally hit by separate bullets.

Angulation of approximately 20° ^{bullet track through body at 27° -} accounted for by Governor Connally being turned to his right and tilted slightly backwards (see "Analysis of Zapruder frames 222 to 244").

After bullet tumbled through wrist it fragmented; some fragments in car, several fragments in wounds, and probably some fragments lost.

(conclusion 3): Zapruder film shows JFK's head snaps forwards between f.312 and f.313, head exploding in yellow and pink. Through f.314 to f.321 JFK moves (extremely rapidly) back down and round to his left. Impact of bullet knocks JFK's head forwards/

forwards from f.312 to f.313 - transfer of momentum. Movement back, down and round to left is due to a neuromuscular reaction - head shot tore off right pre-central gyrus, this area is the motor control for the muscles of the left side of the body. (And JFK turning and leaning to his left, prior to f.313 - thus muscles of left side of his body contracting slightly). Ripping off of motor cells from their fibres, by head-shot bullet, depolarises the nerve fibre membranes (e.g. stimulates nervous impulses) of the whole of the motor nerves supplying muscles of left side of body. The nervous impulse conduction time, taking distance from head to waist of JFK as approximately one metre, is 8 milliseconds, plus internuncial nerve (in spinal cord) synaptic delay of one millisecond (2 synapses of approximately 0.4 milliseconds each), plus neuro-muscular synaptic delay of one millisecond gives total time of 10 milliseconds from stimulus to impulses reaching the muscles. The muscles then contract; muscle has a latent period of 2 milliseconds prior to contraction, contraction of muscle then begins, (impulse speed through muscle is 1-3 ^{metres /} ~~milli~~seconds, therefore total time of impulse depends on length of muscles involved - in this case the muscles involved are of varying lengths therefore total time of impulse through whole length of muscles is not determinable accurately), the duration of contraction phase of muscle fibrils being approximately 10 milliseconds.

Thus contraction of muscles of left side of JFK starts approximately 12 milliseconds after impact of bullet, (time from impulse reaching muscles to end of last contraction of muscle fibrils is indeterminable accurately but is in the order of 40 milliseconds - thus total contraction of muscles approximately 12-50 milliseconds after bullet impact).

Normally only a fraction of muscle fibrils are contracting at/

at once - asynchronous discharge from pre-central gyrus; in the case of JFK head shot the discharge along motor nerves is to all the motor nerves of left side of body - the muscle contraction following total stimulation of all motor units of a muscle is enormous. Thus there is an enormous contraction of muscles of left side of JFK approximately 12-50 milliseconds after head shot. Contraction of muscles of left side of body causes body to turn back, down and round to left - and this is the movement of JFK through f.314 to f.321. Time between successive Zapruder frames is 56 milliseconds. Thus muscle contraction occurs between f.313 and f.314. Since this muscle contraction is total, after initial contraction there are no fibrils left which are in a position to contract (muscle fibres have a refractory period during which time a stimulus does not instigate a contraction) so there is a violent jerk backwards, down and round to left approximately 12-50 milliseconds after head shot, giving an enormous acceleration to the head (and body); after this initial acceleration there is no further acceleration caused by muscle contraction. (c.f. Joshiah Thompson's findings in "Six Seconds in Dallas" regarding head shot, head movement and velocities).

Bullet enters above and to right of occipital protuberance and fragments on passage through skull - main part of bullet makes its exit through right parietal bone (shot fired from almost directly behind with JFK's head turned and tilted to his left and tilted forwards) explosive nature of exit tears out most of parietal bone and a little occipital bone. Brain tissue and skull fragments thrown in all direction (due to explosive nature of exit), mainly forwards due to trajectory of bullet but also considerable amount of brain and skull thrown to left and back due to the almost immediate, extremely violent, jerk of JFK's head to left and back. This correlates with testimony of/

of occupants of car, testimony of Police Officers Hargis and Martin and other film and witness evidence.

Main part of bullet carried on in a straight line after exit from JFK's skull, hit curb on S. side of Main Street, ricochet hitting Tague on cheek. Accounts for FBI finding that curb shot was not caused by an unmutilated bullet of type used - bullet had fragments broken off it in transit through JFK's head.

Some fragments from head shot in car and a few in JFK's head.

(conclusion 4): See letter to "Life" Editor dated 28th February, 1970, concerning stem causing JFK's anterior neck wound. Stem probably caused puncture wound in skin, tracheal tear, and bruise on apex of right lung (apex of lung is anatomically in close apposition to trachea at this region) - accounts for alignment and nature of tears and wounds. JFK falls onto roses after fatal shot - roses braced by Mrs. Kennedy's right leg as she starts to climb onto boot of car.

Reaction of witnesses:

No one expecting a shot - backfires common in motorcade, and firecrackers sometimes thrown - one would expect that it would be the second shot which would make witnesses start to realise noises were not backfires or firecrackers.

Governor Connally was already turned to his right - see Willis photo 4 - so he had only to turn and tilt his head back slightly at sound of first shot - see Zapruder film.

Mrs. Connally said she turned to see JFK with hands at his neck after first shot - at f.258 she is looking back towards JFK, who has his hands near his neck. This is approximately 6 seconds/

seconds after first shot. Possibly JFK said "My God, I'm hit", as Kellerman testified, probably just after time JFK realised he was hit - e.g. just after f.193 - possibly in region of f.200-f.220 - Mrs. Connally then turns to see JFK - she is turning in sequence f.230-f.244, is fully turned back by f.258. May have been JFK's exclamation and/or noise of first shot which caused her to turn. Mrs. Connally said a short time after first shot there was a second shot and Governor Connally collapsed. Second shot was at f.224 (- sound reaches car by f.226) - she does not turn to Governor Connally till f.260-f.270 - indicates Governor Connally, after being hit, cried out between f.235 - f.250. Mrs. Connally then reacts to Governor Connally collapsing and crying out.

Hill, Greer and Kellerman react after noise of second shot. Hill turns to his right starting at f.230 - 0.33 seconds after second shot. Kellerman turns to look back at JFK through f.270-f.280 - similar time as Mrs. Connally. Greer turns to look back through f.307-f.317 - during this sequence Kellerman is reaching for or may be holding the intercomm. microphone - Kellerman turned to front and reached for 'mike' saying "Let's get out of here, we are hit". Greer's turn back through f.307-f.317 is possibly his reaction to seeing Kellerman turn to look back and/or Kellerman shouting. May possibly have been Greer's reaction to hearing second shot. Greer turns to front, on realising the situation, and he accelerates the car - car did not accelerate till sometime after fatal shot (approximately 3 seconds) - Greer, in turning to look back over his right shoulder probably lifted his right foot off the accelerator - car slows - numerous witnesses noted this.

S.A. Bennett, in follow-up car, said at sound of second shot he saw JFK hit in shoulder and lurch forward - sound of second shot/

shot reached Bennett at f.225-6 - JFK lurches forward, in reaction to shot in shoulder, through f.237-f.236.

Zapruder said he saw JFK hit before he went behind traffic sign (at f.210); JFK appears to start to react at f.193. Zapruder film starts to blur (due to Zapruder's reaction to what he is seeing and hearing) at about this time.

Jean Hill (standing beside Mary Moorman, who is taking a photo) is facing to her right away from JFK at f.304 - she watched JFK go past till f.295 then turned back to her right - probably saw Clint Hill jump off running board of follow-up car and run towards JFK - then she turned back to look at JFK, through f.304 to f.312, to see why Hill running towards JFK. Shows Jean Hill did not realise shooting till just prior to f.313.

Charles Brehm is visible, with his son, through f.276-f.297 - throughout the whole of this sequence Brehm is applauding - he, too, has not realised the shooting, even though first shot was 7 to 8 seconds earlier.

The three men on the steps in the background of Marie Muchmore film have not reacted at f.42 of her film - this is fatal shot frame. They have only just started to react at f.55 about $\frac{1}{2}$ -1 second after fatal shot. Shows slow realisation time of spectators to sound of shots.

From Zapruder film, motorcycle cops Hargis and Martin each turn to look at JFK after second shot - Hargis starts turn at f.230, Martin at f.237. As with Hill, are reacting a split second after second shot - they realise something is wrong - this is their job (to react quickly) - not so with spectators.

These/

These points show spectators did not realise the shooting was occurring till just before or just after the fatal shot.

Several witnesses, notably some in the motorcade (e.g. Mrs. Cabell and Senator Yarborough) said they could smell gunpowder. Several spectators saw a puff of smoke near concrete wall. Is unlikely that puff of smoke came from a rifle - probably a firecracker thrown over wall, at approximate time of head shot, by spectator before that person realised what was happening. The strong W. to S.W. wind (see Zapruder film for effect on flags at front of limousine) would disperse the puff of smoke (gunpowder from firecracker) blowing it across the path of the oncoming motorcade. This could also account for confusion among witnesses as to number of shots - 3 or 4 - sound of firecracker is similar to a gunshot report.

1st shot at approximately f.145-f.150,

2nd shot at f.224 - approximately 4 - 4.3 seconds after 1st shot;

3rd shot at f.313 - 4.9 seconds after 2nd shot.

Time span from 1st to third shot of approximately 8.9-9.3 seconds. (Is difficult to comment on witnesses' opinions on interval between shots and time span till know exact time of first shot).

Contra-indications of other theories:

(1) Theory that anterior neckwound was caused by entering bullet.

The alignment of tears in shirt and tie and wounds in anterior neck indicate a path in from front from JFK's left to right. Even when JFK turned fully to his right at f.193 there is no possible position in Dealey Plaza from which this front shot could/

could have been fired (Overpass too far away) by an unseen assassin. No metal traces on tears in shirt and tie - a bullet would leave minute metal traces.

(2) Theory that anterior neck wound was caused by a bullet making its exit.

Wound characteristics unlike those of exiting bullet. No path found through from shoulder wound to anterior wound - bullets leave a path in body. No metal traces on tears on shirt and tie.

(3) Theory that anterior neckwound was caused by a bone fragment, from head shot, making its exit.

No hole in base of skull was found by Autopsy surgeons or 1968 Panel Review of X-rays and photos. Bone fragment through from base of skull to trachea would have to pass through pharynx - no pharyngeal wound noted by doctors.

(4) Theory that Governor Connally shot at f.238 of Zapruder film.

See "Analysis of Zapruder frames 222 to 244" - impact on Governor at f.224; Governor Connally starts to react to pain of shot 9 frames prior to f.238.

(5) Theory that JFK shot by a bullet, from right front, at f.314, 0.056 seconds after shot at f.313.

No entry wound on right side of skull. No apparent exit damage on left side of skull. No track through brain from right front. No apparent impact at f.314 of Zapruder film, compared with f.313 impact.

Contra-indications to conclusions drawn:

- (1) Inconsistency of penetration of bullets: - high penetrating power of second and third shots, but low penetration of first shot.
- (2) Fragment from head shot causing nick in curb and Tague injury: - Tague stood approximately 270 feet from JFK at time of head shot - is a long way for a fragment of bullet to travel; and angles involved (with regard to inclination of line from nick in curb to JFK's head at time of head shot) not known as yet.
- (3) Skull fragments and brain tissue thrown back and left after fatal shot: - Hargis and Martin hit by skull fragments and brain tissue; Hargis hit so hard he thought he had been shot - neuromuscular reaction extremely violent in this case (far greater than normal muscle contraction) but is it enough to explain the high velocity of fragments and tissue to left and back?
- (4) Rose stem causing JFK's anterior neck wound: - could rose stems have been strong and rigid enough to pierce JFK's shirt, skin and trachea?
- (5) Commission Exhibit 399: - apparently found on neither JFK's or Governor Connally's stretcher; were there too many fragments in JFK's neck for them to have come from C.E. 399?
- (6) JFK's reaction time of approximately 2.6 seconds to shoulder wound: - is a long time.